We Claim

1. A method of automatically dispensing liquid from a pipette comprising:

restricting gas flow into said pipette to thereby substantially retain a column of liquid there within;

computing a timing parameter based at least in part on (i) height of said liquid column within said pipette, and (ii) a desired quantity of said liquid to dispense; and

automatically controlling gas flow into said pipette in accordance with said timing parameter to thereby dispense substantially said desired quantity of liquid from said pipette.

2. The method of claim 1 wherein said restricting includes maintaining a valve closed, and said controlling includes opening said valve for a time period based at least in part on said timing parameter.

3. The method of claim 1 wherein said computing includes accessing a stored mathematical model.

4. The method of claim 3 wherein said computing further includes calculating said timing parameter.

5. The method of claim 3 wherein said computing further includes looking up said timing parameter from a stored table of empirical values.

6. The method of claim 1 wherein said controlling includes actuating a pump.

7. The method of claim 1 further including measuring negative pressure at the top of said column, and ascertaining liquid column height based at least in part on said measured negative pressure.

8. The method of claim 1 further including contacting said liquid only with said pipette during said aforementioned steps.

9. The method of claim 1 wherein said controlling includes using an open-loop control mechanism.

10. The method of claim 1 wherein said controlling controls said dispensing without using feedback.

11. The method of claim 1 further including decoupling said pipette from a handheld fixture and disposing of said pipette after use.

12. The method of claim 1 further including repeating said computing and controlling to repetitively dispense said desired quantity.

13. The method of claim 12 wherein said repeating is performed in response to user actuation.

14. A non-contacting, open loop automatic fluid dispensing method comprising:

programming an amount of fluid to be dispensed from a reservoir;

using a mathematical model to generate a time parameter; and

controlling dispensing of said fluid based at least in part on said time parameter,

wherein said method accurately dispenses said desired quantities over different column heights within said reservoir.

15. The method of automatically dispensing fluid from a fluid reservoir comprising:

programming an electronic controller with a desired quantity of fluid to be dispensed;

measuring a pressure associated with the fluid reservoir;

deriving at least one open-loop control output parameter from said measured pressure and said programmed desired quantity; and

applying a signal corresponding to said derived open-loop control parameter to at least one fluid flow control element coupled to said fluid reservoir,

wherein said applying causes substantially said desired fluid quantity to be automatically dispensed.

16. The method of claim 15 wherein said reservoir comprises a pipette.

17. The method of claim 15 wherein said flow control element includes an electric valve and said control output parameter comprises opening time of said valve.

18. The method of claim 15 further including powering an electric pump.

19. The method of claim 15 wherein said reservoir provides a suspended fluid column and said measuring includes measuring the vacuum at the top of the suspended fluid column.

20. The method of claim 15 further including issuing a control output causing said reservoir to be at least partially refilled with fluid.

21. The method of claim 15 wherein said deriving includes calculating at least one non-linear equation.

22. The method of claim 15 further including a look-up table.

23. A system for automatically dispensing quantities of fluid from a reservoir, comprising:

a storage medium that stores a parameter relating to a desired quantity of fluid to be dispensed;

a pressure transducer that measures a pressure associated with the reservoir;

at least one fluid flow control element coupled to said reservoir; and

a processor coupled to said storage medium, said processor deriving at least one open-loop control output parameter from said measured pressure and said stored quantity parameter; and applying an open-loop control signal corresponding to said derived open-loop control parameter to said fluid flow control element to control substantially said desired fluid quantity to be dispensed.

24. The system of claim 23 wherein said reservoir comprises a pipette.

25. The system of claim 23 wherein said flow control element includes an electric valve.

26. The system of claim 23 wherein said flow control element includes an electric pump.

27. The method of claim 23 wherein said transducer measures the vacuum at the top of a suspended fluid column.

28. The method of claim 23 further including means for issuing a control output causing said reservoir to be at least partially refilled with fluid.

29. An electronic, hand held fluid dispensing system for use with a laboratory pipette, comprising:

a housing capable of being held in one hand;

a coupler disposed at least partially within said housing, said coupler being adapted to be removably connected to said pipette;

a source of pressure and/or vacuum;

a valve pneumatically coupled between said source and said coupler;

at least one pressure transducer pneumatically coupled to said coupler, said pressure transducer generating at least one output; and

an electronic controller electrically coupled to control at least said valve and also electrically coupled to said pressure transducer, said electronic controller operating in an open-loop mode to control said valve in accordance with a valve controlled parameter derived from said pressure transducer output, said valve control parameter controlling said valve so that said system automatically, repetitively dispenses substantially a predetermined quantity of fluid from said pipette.

30. The system of claim 29 wherein said source comprises an electric air pump.

31. The system of claim 29 wherein said source comprises a source of atmospheric pressure.

32. The system of claim 29 wherein said source comprises a source of a pressurized gas.

33. The system of claim 29 wherein said source comprises a reversible electric pump that selectively generates suction and positive pressure, and wherein said electronic controller is coupled to selectively control said pump to generate suction to draw fluid into said pipette.

34. The system as in 29 wherein said hand-held housing is gun-shaped.

35. The system as in 29 wherein said electronic controller dynamically calculates said valve control parameter based on a non-linear mathematical model.

36. The system as in 29 wherein said electronic controller uses a look-up table to ascertain said valve control parameter based on measured pressure.

37. The system as in 29 where further including a further pressure transducer that measures pressure between said source and said valve, and wherein said electronic controller is responsive to said second pressure transducer for controlling said source to compensate for variations in the output pressure of said source.

38. The system as in 29 wherein said coupler is adapted to accept pipettes of different sizes.

39. The system as in 29 further including a graphical display disposed on said housing and coupled to said electronic controller.

40. The system as in 29 further including means for allowing an end user to program said desired quantity.

41. The system as in 40 wherein said means comprises first and second push buttons mounted on said housing, said first and second push buttons in one mode of operation being used to program said desired quantity, and in a further mode of operation being used to control aspiration and dispensing rate.

42. The system as in 40 wherein said means comprises software executed by said electronic controller that allows said electronic controller to learn said desired quantity based on user operation of said system.

43. The system as in 29 wherein said system achieves repeatable dispensing accuracies of better than 1%.

44. The system as in 29 wherein said fluid control element comprises an electronic valve with a on/off orifice, and wherein said control parameter controls the duration of opening of said valve orifice.

45. The system as in 29 wherein said fluid control element comprises a valve with a variable orifice, and wherein said control parameter controls the amount said valve orifice is opened.

46. The system as in 29 wherein said electronic controller controls said source to reduce undesired dripping of fluid from said pipette.

47. The system as in 29 wherein said electronic controller derives an indication of the angle of said pipette from vertical.

48. The system as in 29 wherein said electronic controller compensates for different fluid viscosities.